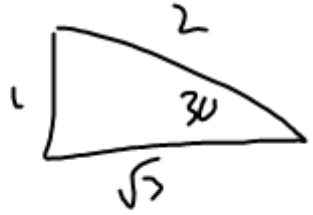
#29 in 5.4

$$\tan(\theta+30) = \frac{\tan\theta+\tan 30}{1-\tan\theta\tan 30} = \frac{\tan\theta+\frac{\sqrt{3}}{3}}{1-\tan\theta\frac{\sqrt{3}}{3}}$$

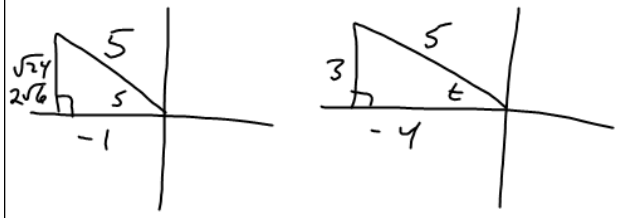
$$\frac{\frac{3}{3}\cdot\frac{\tan\theta}{1}+\frac{\sqrt{3}}{3}}{\frac{3}{3}\cdot\frac{1}{1}-\frac{\sqrt{3}\tan\theta}{3}} \Rightarrow \frac{\frac{3\tan\theta+\sqrt{3}}{3}}{\frac{3-\sqrt{3}\tan\theta}{3}} \Rightarrow \frac{3\tan\theta+\sqrt{3}}{3}\cdot\frac{3}{3-\sqrt{3}\tan\theta}$$



$$\frac{3\tan\theta+\sqrt{3}}{3-\sqrt{3}\tan\theta}$$

42 in 5.4

$\cos s = -\frac{1}{5}$ $\quad \sin t = \frac{3}{5}$ $\quad$ QII



$\cos(s+t) = \cos(s)\cos(t) - \sin(s)\sin(t)$

$= \frac{-1}{5} \cdot \frac{-4}{5} - \frac{2\sqrt{6}}{5} \cdot \frac{3}{5} = \frac{4 - 6\sqrt{6}}{25}$

$\sin(s+t) = \sin(s)\cos(t) + \cos(s)\sin(t)$

$= \frac{2\sqrt{6}}{5} \cdot \frac{-4}{5} + \frac{-1}{5} \cdot \frac{3}{5} = \frac{-8\sqrt{6} - 3}{25}$

$\tan(s+t) = \frac{\tan s + \tan t}{1 - \tan s \tan t} = \frac{\frac{4}{4}\frac{2\sqrt{6}}{-1} + \frac{-3}{4}}{1 - \frac{2\sqrt{6}}{-1} \cdot \frac{-3}{4}} \Rightarrow \frac{\frac{-8\sqrt{6} - 3}{4}}{\frac{4 - 6\sqrt{6}}{4}}$

$\frac{-8\sqrt{6} - 3}{4} \cdot \frac{4}{4 - 6\sqrt{6}} = \frac{-8\sqrt{6} - 3}{4 - 6\sqrt{6}} \cdot \frac{4 + 6\sqrt{6}}{4 + 6\sqrt{6}}$

(6) $\dfrac{\cos(\alpha-\beta)}{\cos\alpha\sin\beta} = \tan\alpha + \cot\beta$

$\dfrac{\cos\alpha\cos\beta + \sin\alpha\sin\beta}{\cos\alpha\sin\beta}$

$\dfrac{\cos\alpha\cos\beta}{\cos\alpha\sin\beta} + \dfrac{\sin\alpha\sin\beta}{\cos\alpha\sin\beta}$

$\cot\beta + \tan\alpha$

(5) $\tan 15^\circ = \tan(45-30)$

$\tan 15^\circ = \dfrac{\tan 45 - \tan 30}{1 + \tan 45 \tan 30}$

$= \dfrac{1 - \frac{\sqrt{3}}{3}}{1 + \frac{\sqrt{3}}{3}} \cdot \dfrac{1 - \frac{\sqrt{3}}{3}}{1 - \frac{\sqrt{3}}{3}}$

$\dfrac{1 - \frac{2\sqrt{3}}{3} + \frac{3}{9}}{1 - \frac{3}{9}} = \dfrac{\frac{4}{3} - \frac{2\sqrt{3}}{3}}{\frac{2}{3}}$

$\dfrac{4 - 2\sqrt{3}}{3} \cdot \dfrac{3}{2} = 2 - \sqrt{3}$

$\cos(2x) = \cos(x+x)$ Double-Angle for Cosine

$= \cos x \cos x - \sin x \sin x$

$\boxed{\cos(2x) = \cos^2 x - \sin^2 x}$

$\cos(2x) = \cos^2 x - (1 - \cos^2 x)$

$\boxed{\cos(2x) = 2\cos^2 x - 1}$

$\cos 2x = (1 - \sin^2 x) - \sin^2 x$

$\boxed{\cos 2x = 1 - 2\sin^2 x}$

$$\sin 2x = \sin(x+x)$$

$$= \sin x \cos x + \cos x \sin x$$

$$\boxed{\sin(2x) = 2\sin x \cos x}$$

$$\tan 2x = \tan(x+x)$$

$$= \frac{\tan x + \tan x}{1 - \tan x \tan x} \Rightarrow \boxed{\tan(2x) = \frac{2\tan x}{1 - \tan^2 x}}$$

Do these problems:

① Given $\cos x = \frac{3}{5}$ and $\sin x < 0$, find $\sin 2x$, $\cos 2x$, $\tan 2x$.

② Find the value of the 6 trig. functions of x if $\cos 2x = \frac{4}{5}$ and $\frac{\pi}{2} < x < \pi$.

③ Verify that $\cot x \sin 2x = 1 + \cos 2x$ is an identity.

$\frac{\cos x}{\sin x} \cdot \frac{2\sin x \cos x}{1}$

$2\cos^2 x = 1 + \cos 2x$

$1 + 2\cos^2 x - 1$

④ Write $\sin 3x$ in terms of $\sin x$.

$\sin(2x + x) = \sin 2x \cos x + \cos 2x \sin x$

$2\sin x \cos x \cdot \cos x + (1 - 2\sin^2 x)\sin x$

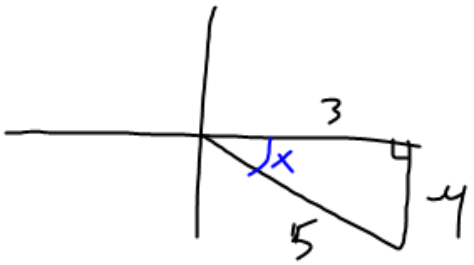
$2\sin x \cos^2 x + \sin x - 2\sin^3 x$

$2\sin x(1 - \sin^2 x) + \sin x - 2\sin^3 x$

$2\sin x - 2\sin^3 x + \sin x - 2\sin^3 x$

$\sin 3x = 3\sin x - 4\sin^3 x$

⑪ $\cos x = \frac{3}{4}$ $\sin x < 0$



$\sin 2x = 2 \sin x \cos x$

$\sin 2x = 2\left(\frac{-4}{5}\right)\left(\frac{3}{5}\right) = \boxed{\frac{-24}{25}}$

$\cos 2x = \cos^2 x - \sin^2 x$

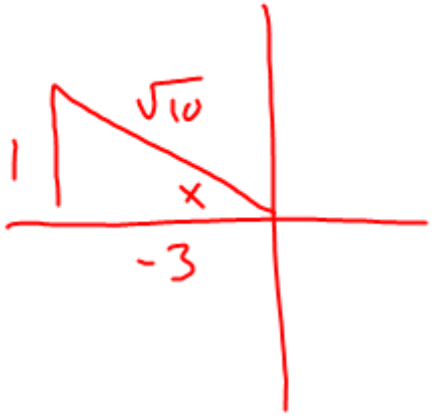
$= \left(\frac{3}{5}\right)^2 - \left(\frac{-4}{5}\right)^2$

$\frac{9}{25} - \frac{16}{25} = \boxed{-\frac{7}{25}}$

$\tan 2x = \frac{2\left(\frac{-4}{3}\right)}{1 - \left(\frac{-4}{3}\right)^2} \Rightarrow \frac{\frac{-8}{3}}{\frac{-7}{9}} \Rightarrow \frac{-8}{\cancel{3}_{1}} \cdot \frac{\cancel{9}^{3}}{-7} = \boxed{\frac{24}{7}}$

$\frac{\frac{9}{9} - \frac{16}{9}}{}$

$\cos 2x = \frac{4}{5}$ $\qquad \frac{\pi}{2} < x < \pi$



$\cos 2x = 2\cos^2 x - 1$

$\frac{4}{5} = 2\cos^2 x - 1$

$+1 \qquad +1$

$\frac{9}{5} = 2\cos^2 x \rightarrow \sqrt{\frac{9}{10}} = \sqrt{\cos^2 x}$

$\frac{1}{2} \qquad \frac{2}{2}$

$\pm \frac{3}{\sqrt{10}} = \cos x$

HW

- Sect. 5.5 # 1-8, 11, 12, 17-20, 29, 30
- Study for Quiz over 5.1 – 5.4 tomorrow
- Start getting ready for test on Thursday.